

WIRELESS COMMUNICATIONS WITH FREQUENCY BAND SELECTION

[0001] This application claims the priority under 35 U.S.C. 119(e)(1) of the following copending U.S. provisional applications: No. 60/210,851 filed on Jun. 9, 2000; No. 60/215,953 filed on Jul. 5, 2000; Nos. 60/216,290, 60/216,436, 60/216,291, 60/216,292, 60/216,413 and 60/216,433 filed on Jul. 6, 2000; Nos. 60/217,269, 60/217,272 and 60/217,277 filed on Jul. 11, 2000; and No. 60/228,860 filed on Aug. 29, 2000. All of the aforementioned provisional applications are hereby incorporated herein by reference.

[0002] This application is related to the following copending applications filed contemporaneously herewith by the inventors of the present application: Docket Nos. TI-31284 and TI-31286 respectively entitled "Wireless Communications with Efficient Channel Coding" and "Wireless Communications with Efficient Retransmission Operation".

FIELD OF THE INVENTION

[0003] The invention relates generally to wireless communications and, more particularly, to wireless communications that utilize: channel coding; multiple data rates; multiple modulation and channel coding schemes; or automatic repeat request (ARQ).

BACKGROUND OF THE INVENTION

[0004] The IEEE 802.15 Task Group 3 has outlined requirements for a high rate wireless personal area network (WPAN). Various data rates are to be provided to support, for example, audio, video, and computer graphics.

[0005] The present invention provides for a WPAN that supports data rates for a variety of applications including audio, video and computer graphics. According to the invention, a probe, listen and select technique can be used advantageously to select from an available frequency spectrum a frequency band whose communication quality is suitable for communication at a desired data rate. Probe packets are transmitted on different frequencies during a known period of time, and frequency channel quality information is obtained from the probe packets. This quality information is used to select a desirable frequency band. The communication quality of the selected band can also be used as a basis for selecting from among a plurality of modulation and coding combinations that are available for use in communication operations. Further according to the invention, ARQ operations can be implemented by sending a plurality of data packets in a superpacket, and responding with an ARQ acknowledgement packet that indicates which packets of the superpacket require retransmission. Further according to the invention, a data encoding algorithm can be used to generate redundant (overhead) bits from original data bits, and the data bits and redundant bits can be sent in respectively separate transmissions, if the redundant bits are needed. At the receiver, the original data bits can be determined from the received redundant bits, or the received data bits and the received redundant bits can be combined and decoded together to produce the original data bits.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. 1 illustrates in tabular format exemplary parameters of a WPAN according to the invention.

[0007] FIG. 2 diagrammatically illustrates exemplary configurations of WPAN transceiver devices according to the invention.

[0008] FIG. 3 illustrates in tabular format exemplary parameters associated with first and second operational modes of a WPAN transceiver according to the invention.

[0009] FIG. 4 illustrates in tabular format a transmit spectrum mask associated with the operational modes illustrated in FIG. 3.

[0010] FIG. 5 is a state transition diagram which illustrates exemplary transitioning of transceiver devices between the modes of operation illustrated in FIG. 3.

[0011] FIG. 6 diagrammatically illustrates an exemplary frame format structure for mode 2 to transmissions according to the invention.

[0012] FIG. 6A graphically illustrates exemplary constellation points of the 16 QAM constellation which can be utilized for selected symbol transmission in mode 2 according to the invention.

[0013] FIG. 7 diagrammatically illustrates operations of an exemplary WPAN according to the invention.

[0014] FIG. 8 is an exemplary timing diagram for communications in the WPAN of FIG. 7.

[0015] FIG. 9 diagrammatically illustrates an exemplary acquisition and packet reception algorithms for a mode 2 receiver according to the invention.

[0016] FIG. 10 diagrammatically illustrates an exemplary embodiment of a mode 2 receiver which can implement the algorithms of FIG. 9.

[0017] FIG. 11 diagrammatically illustrates an exemplary embodiment of a mode 2 transmitter according to the invention.

[0018] FIG. 12 illustrates exemplary transmit encoding and receive decoding operations according to the invention.

[0019] FIG. 12A diagrammatically illustrates pertinent portions of an exemplary transceiver embodiment that can perform receive operations shown in FIG. 12.

[0020] FIG. 12B diagrammatically illustrates pertinent portions of an exemplary transceiver embodiment that can perform transmit operations shown in FIG. 12.

[0021] FIG. 13 graphically compares exemplary simulation results obtained using conventional Bluetooth operation (131) with exemplary simulation results obtained using mode 2 operation according to the invention with 16 QAM (132) and 64 QAM (133).

[0022] FIGS. 14 and 14A illustrate in tabular format exemplary parameters associated with WPAN transceivers operating in mode 3 according to the invention.

[0023] FIG. 14B illustrates part of an exemplary embodiment of the mode controller of FIG. 19A.

[0024] FIG. 15 illustrates in tabular format a transmit spectrum mask which can be used by mode 3 transceivers according to the invention.

[0025] FIG. 16 graphically compares mode 3 performance with and without PLS according to the invention.